DEVELOPMENT SERVICES DEPARTMENT

Building Safety Division

PV SYSTEM – 2011 NEC & 2012 IFC
PLAN CHECK WORKSHEET

(Please indicate Yes, No, or provide the required information)

1.0 - SUPPLIED DIAGRAMS *The following shall be included in the permit package:*

❑ Yes ❑ No (A) A basic site diagram

❑ Yes ❑ No (B) The location of electrical equipment is identified on the plan

❑ Yes ❑ No (C) Structural calculations for other than SFD per Section 6.0(C)

❑ Yes ❑ No (D) The Array Configuration including roof access and pathways, any existing Rooftop Equipment, Plumbing Vents, Exhaust Vents or Flues. IFC 605.11.3.2.

❑ Yes ❑ No (E) A 3-line diagram

2.0 - INVERTER INFORMATION

❑ Yes ❑ No (A) Cut sheets for the Inverter.

❑ Yes ❑ No (B) The Inverter(s) listed utility-interactive *(see CEC list of eligible inverters)*

_____ (C) Inverter Model Number.

_____ (D) Maximum overcurrent protection rating permissible *(from Cutsheet or listing Label)*

_____ (E) Input voltage range of Inverter

3.0 - PV MODULE INFORMATION

❑ Yes ❑ No (A) Cut sheets for the PV modules

❑ Yes ❑ No (B) The modules are listed *(see CEC list of eligible modules)*

_____/_____ (C) Open-circuit voltage (V_{OC}) from the listing label

_____/_____ (D) Maximum system voltage from the listing label

_____/_____ (E) Short-circuit current (I_{SC}) from the listing label

_____/_____ (F) Maximum series fuse (OCPD) rating from listing label

_____/_____ (G) Maximum Power (P_{max}) at STC from listing label

_____/_____ (H) Maximum power-point voltage (V_{mp}) from listing label

_____/_____ (I) Maximum power–point current (I_{mp}) from listing label

4.0- ARRAY INFORMATION (Provide calculations required for strings of varying numbers)

_____/_____ (A) Number of modules in series

_____/_____ (B) Number of parallel circuits

_____/_____ (C) Total number of modules

_____/_____ (D) Operating Voltage = (number of modules in series x module voltage at V_{mp})

_____/_____ (E) Operating Current = (number of parallel source circuits x module current at I_{mp})

_____/_____ (F) Maximum system voltage 690.7 = (V_{oc} * 1.18 * number of modules in series)

_____/_____ (G) Short-circuit current 690.8 = (I_{sc} * 1.25 * number of parallel source circuits)

5.0 - WIRING AND OVERCURRENT PROTECTION (Provide calculations for each Inverter)

❑ Yes ❑ No (A) Conductor type is 90ºC and suitable for wet locations

❑ Yes ❑ No (B) All conductor ampacities are sufficient

❑ Yes ❑ No (C) Provide adjusted ampacities for temperature with calculations NEC 310.15(B)(2)

❑ Yes ❑ No (D) Point of connection meets provisions of NEC 690.64

_____ (E) Point of connection panel buss bar rating NEC 705.12

6.0 - ROOF INFORMATION *(for rooftop systems on single family dwellings)*

❑ Yes ❑ No	(A) Are the conductors from the PV Array run through the house? (If yes, indicate what method will be used to address the protection issues).
_____	(B) Weight of array for rooftop systems. (Lbs. per Sq. Ft. including mounting hardware)
	(C) For single family dwellings under 30 years old and the array weight is less than 5lbs/sq. ft., then engineering calcs are unnecessary for roof loading
❑ Yes ❑ No	(D) If the roof structure is over 30 years old, describe the structural elements: ❑ _____Size of rafters (e.g. 2" x 6") ❑ _____Span of rafters (e.g. 14') ❑ _____Spacing of rafters (e.g. 24" O.C.)
_____	(E) Identify roofing type (e.g. comp. shingle, masonry tile, shake, etc.)
❑ Yes ❑ No	(F) The detail of PV panel mounting attachment to the roof-framing members is provided?
_____	(G) Identify the method of sealing the roof penetrations (e.g. flashing, sealed with urethane caulk, etc.)

7.0 - GROUND MOUNTING STRUCTURE *(for ground-mounted structures)*

❑ Yes ❑ No	(A) The weight of array is indicated (pounds per square foot – including mounting hardware)
❑ Yes ❑ No	(B) The details of the array supports, framing members, and foundation posts and footings are provided
❑ Yes ❑ No	(C) The information on the mounting structure(s) construction is provided *(If the mounting structure is unfamiliar to the local jurisdiction or is more than six feet above grade, engineering calculations are required)*

8.0 - INSPECTION GUIDELINES FOR ALL PHOTO VOLTAIC SYSTEMS

- Equipment, conduit, and wiring are installed according to approved plans.
- At a minimum a copy of the three-line diagram and the plot plan should be available at the site for the inspector's use during field inspections.
- If any deviation exists between the reviewed plans and the site installation, those changes should be noted on the drawings along with any necessary explanation as to why the changes were made to the plans.
- If substantial changes are found in the field installation, the as-built changes may need to be referred back to plan review to ensure code compliance.
- Marking shall be placed on interior and exterior DC conduit, raceways, enclosures and cable assemblies every 10 feet within 1 foot of turns or bends and within 1 foot above and below penetrations of roof/ceiling assemblies, walls or barriers. "WARNING: PHOTOVOLTAIC POWER SOURCE."
- The materials used for marking shall be reflective, weather resistant and suitable for the environment. Marking shall have all letters capitalized with a minimum height of 3/8 inch white on red background as required in IFC Sections 605.11.1.2 through 605.11.1.4.

9.0 - FIELD INSPECTION CHECKLIST FOR ELECTRICAL THREE-LINE:

- PV module model number matches plans and cut sheets
- PV modules are properly grounded
    - Modules shall be bonded with listed / identified lugs or equipment grounding screws on each module and mounting rails or other approved method.
    - Another method is to attach a bonding conductor from each module to a listed / identified lug on the rails with the grounding conductor attached to a lug on the rails.
- Check that the wiring is consistent with the callouts on the plans (number of modules)
- Check that the cable and conduit is properly supported.
- Where plug connectors are used for module wiring, inspect a sample of the connections to make sure that the connectors are fully engaged.

10.0- STRUCTURAL ATTACHMENT

- The array is attached to structure according to the plans and manufactures installation instructions.
- The field inspector should review the structural attachment to confirm it matches the supplied detail.

11.0- SIGN INSTALLATION REQUIREMENTS

❑ Sign Construction:
- Signs or labels shall be of sufficient durability to withstand the environment.
- For outdoor signs, the sign should be either metal or plastic with engraved or machine printed letters, or electro-photo plating, in a contracting color to the sign background.
- Plexiglas-covered paper or laminated paper directories are also acceptable provided that the signs are sufficiently protected from the environment involved. The signs or directories shall be attached to the electrical equipment or located adjacent to the identified equipment.

❑ Direct-Current Photovoltaic Power Source. (690.53)
<u>This permanent label provided by installer at photovoltaic disconnecting means.</u>
- Rated maximum power-point current.
- Rated maximum power-point voltage.
- Maximum system voltage 690.7
- Maximum circuit current 690.8
- Maximum rated output current of charge controller (if installed)

❑ Interactive System Point of Interconnection (690.54)
<u>To be placed on the Solar AC Disconnect and AC Point of Connection locations</u>
This permanent label must include:
- Rated AC output current. I_{RATED}
- Nominal operating AC voltage (120, 208, 240 or 480 volts)

❑ Check that Inverter matches callouts on one-line diagram.

❑ Facilities with Utility Services and PV System 690.56(B)
- A sign should be mounted on or next to the PV system disconnecting means with the words to the effect of “PV System Disconnect” in a minimum of 3/8” high letters.

If this PV disconnect is not located at the service disconnecting means, follow the requirement in NEC 690.56 (B): Buildings or structures with both utility service and a photovoltaic system shall have a permanent plaque or directory providing the location of the service disconnecting means and the photovoltaic system disconnecting means if not located at the same location.

❑ WARNING SIGN REQUIRED BY NEC 690.17.
Explanation: Any time a switch can have the load side energized in the open position, a warning sign must be placed on the switch. **WARNING: ELECTRICAL SHOCK HAZARD–LINE AND LOAD MAY BE ENERGIZED IN OPEN POSITION**

❑ **Facilities with Stand-Alone Systems. 690.56(A)**

- Any structure or building with a photovoltaic power system that is not connected to a utility service source and is a stand-alone system shall have a permanent plaque or directory installed on the exterior of the building or structure at a readily visible location acceptable to the authority having jurisdiction. The plaque or directory shall indicate the location of system disconnecting means and that the structure contains a stand-alone electrical power system.